

## 10-4 Common Logs

$$\log_{10} x \rightarrow \log x$$

Base of 10

The common logs are used in:

- the richter scale
- pH levels
- decibals of sound

Solve

$$\log_{10} x = 1.65$$

$$10^{1.65} = x$$

$$44.7 = x$$

$$\log y = 1.34$$

$$10^{1.34} = y$$

$$21.9 = y$$

$$\log z = 1.08$$

$$10^{1.08} = z$$

$$12.0 = z$$

Calculator

$$\log 45 \approx 1.65$$

$$\log 22 \approx 1.34$$

$$\log 12 \approx 1.08$$

Solving Exponential Equations

ex

$$3^x = 27$$

$$3^x = 3^3$$

$$x = 3$$

### 3<sup>ANS</sup> Solving Exponential Equations

ex

$$3^{2x} = 5$$

Take the log of both sides!

$$\log 3^{2x} = \log 5$$

$$\frac{2x \log 3}{2 \log 3} = \frac{\log(5)}{(2 \log(3))}$$

$$x = .7325$$

ex

$$2^x = 7$$

$$\log 2^x = \log 7$$

$$\frac{x \log 2}{\log 2} = \frac{\log(7)}{\log(2)}$$

$$x = 2.8074$$

ex:

$$\frac{1}{2}^x \geq 6$$

$$x \log \frac{1}{2} \geq \log 6$$

Check to see if  $\log \frac{1}{2}$  is neg.

$$x \leq \frac{\log 6}{\log \frac{1}{2}}$$

$$x \leq -2.5850$$

ex:

$$42^{x-1} = 17^{3x-1}$$

$$\log 42^{x-1} = \log 17^{3x-1}$$

$$(x-1) \log 42 = (3x-1) \log 17$$

$$x \log 42 - \log 42 = 3x \log 17 - \log 17$$

$$x \log 42 - 3x \log 17 = \log 42 - \log 17$$

Factor:

$$x (\log 42 - 3 \log 17) = \log 42 - \log 17$$

$$x = \frac{(\log(42) - \log(17))}{(\log(42) - (3 \log(17)))} = \frac{.39280}{-2.0481} = -.1869$$

ex:

$$8^{2x-1} = 39^{x+1}$$

ex

Evaluate

$$\frac{\log 9}{\log 2} = \log_2 9 = y$$

$$2^y = 9$$

$$\log 2^y = \log 9$$

$$y \log 2 = \log 9$$

$$y = \frac{\log 9}{\log 2}$$

Cannot do on calc because base of 2

Change of Base Formula

$$\log_a n = \frac{\log_b n}{\log_b a}$$

$n > 0$   
 $a > 0$   
 $b > 0$   
 $b \neq 1$   
 $a \neq 1$

ex

$$\log_4 7 = \frac{\log 7}{\log 4} = 1.4037$$

ex

$$\log_3 5$$

Do:

$$1. \log_7 12 \approx 1.2776$$

$$2. \log_5 3 \approx .6826$$

$$3. 2^{3x} = 7$$

$$3x \log 2 = \log 7 \quad x \approx .9358$$

$$x = \left( \frac{\log 7}{3 \log 2} \right)$$

Show

$$\log_{25} 2 = \frac{\log_5 2}{2}$$

p550

27-49 odd